Confederated Tribes of the Colville Reservation
Office of Environmental Trust
CONFIDENTIAL

April 17, 2002

Monica Tonel, Site Assessment Manager
US Environmental Protection Agency
Environmental Cleanup Office, (ECL-115)
Seattle, WA 98101
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Flora Goldstein
Washington Department of Ecology
N. 4601 Monroe Street, Spokane, WA 99205
fgol461@ecy.wa.gov

Rudy Peone
Spokane Tribe of Indians
P. O. Box 100, Wellpinit, WA 99013
rudy@spokanetribe.com

Re: **Request Meeting to Review Case Strategy**

Dear Monica, Flora and Rudy:

The Lake Roosevelt Water Quality Council ("LRWQC") is currently circulating a Teck Cominco Metals Ltd. report proposal entitled "Sediment Trend Analysis of the Columbia River in Support of Contaminant Management Planning" (the "Cominco Proposal") that was provided to the LRWQC by Bill Duncan, Senior Biologist, Teck Cominco Metals Ltd. A copy of the Cominco Proposal is enclosed for your information. The scope of the Cominco Proposal includes lands and waters within the geographic area currently being investigated by EPA under Superfund. Having contributed tens of millions of tons of metal contaminated waste into the Columbia River above Grand Coulee Dam, Teck Cominco is apparently concerned about its role as a potentially responsible party ("PRP") under Superfund for the release of hazardous substances into the Lake Roosevelt environment.

The timing of the Cominco Proposal is interesting in that the LRWQC has been proposing similar studies for nearly a decade and recently refined a USGS study to determine the location, volume, and flux of contaminated sediment in the system. Along with the LRWQC, Teck Cominco, as well as BC Environment, were participants to the LRWQC/USGS study design. More recently, however, the Canadian government has changed its position, apparently in response to prodding by Teck Cominco and has to date refused to allow EPA, as part of the CERCLA investigation, to perform sampling in the Canadian portion of the Columbia River and Pend Oreille River

Given these facts, the pending Cominco Proposal raises both technical and legal issues that need to be carefully considered by the four government entities with regulatory authority and responsibility in the Lake Roosevelt environment. It is important we use best efforts to develop a unified response to the Cominco Proposal as we all share in the responsibility
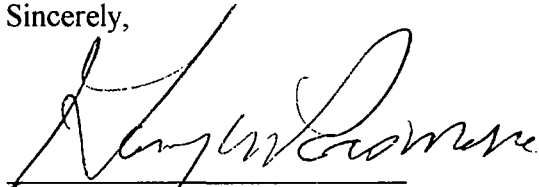
to see to it that the Lake Roosevelt environment is properly protected, remediated and restored. Although it is difficult at this time to gauge the importance of the Cominco Proposal in and of itself, a disjointed or unfocused response will send the wrong message. We should also consider how we may wish to use the Cominco Proposal as a part of our collective strategy in this matter.

If you want to participate in either a conference call or meeting to discuss this issue, the status of the EPA investigation and a proposed course of action, please call or e-mail me at 509-634-2426; gary.passmore@colvilletribes.com.

One possibility would be to meet and discuss this at the Columbia Ecosystem Conference in Spokane that you may be planning attend from April 27 through May 1.

Sincerely,

Gary W. Passmore, Director
Office of Environmental Trust
Confederated Tribes of the Colville Reservation

PROPOSAL 2

SEDIMENT TREND ANALYSIS (STA®) OF THE COLUMBIA RIVER IN
SUPPORT OF CONTAMINANT MANAGEMENT PLANNING
(Canadian Border to Kettle Falls)

Prepared for.
Mr. Bill Duncan
Senior Biologist
Teck Cominco Metals Ltd.
Trail, B C., V1R 4L8

by

Patrick McLaren
GeoSea Consulting Ltd.,
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INTRODUCTION

On Sept. 17, 2001, Mr. Bill Duncan of Teck Cominco invited GeoSea to prepare two proposals to undertake a Sediment Trend Analysis (STA®) of the Columbia River from the Hugh Keenlyside Dam to the Canada/US border (Proposal 1) and from the border to Kettle Falls respectively (Proposal 2). This part of the river has been subject to a variety of contaminant loadings from a large number of sources over many years, particularly from pulp and paper mills and various mining activities (effluents and dispersal of slag materials).

STA is a technique that uses the complete grain-size distributions of the bottom sediments to determine the net transport pathways of the sediments together with their dynamic behaviour (i.e., accretion, erosion, dynamic equilibrium etc.). Because many contaminants associate with particles that make up the natural sediment, this information may be used directly to assess the relationship between contaminant loadings and their sources, as well as the fate and behaviour of contaminants that may be contained in the sediments.

The purpose of this work, therefore, is to map in detail the sediment types present in the river and, using STA, determine their transport pathways and dynamic behaviour. This information will be correlated with present levels of contaminants and used to assess their relationship with probable sources. In addition, the analysis will show where contaminant hotspots are likely to occur and the environmental implications of remediation options.

TECHNICAL PROPOSAL

DATA REQUIREMENTS

The fundamental data required for STA are the complete grain-size distributions of bottom sediments taken on a regular sampling grid covering the area of interest. It is essential that sampling covers all environments that are likely to be affecting the movement and deposition of sediment. It is proposed to sample on a hexagonal grid with a spacing of 125 m at the north end of the study area where the river is narrow (Fig.1). As the river widens, the sample spacing is increased to 250 m (Fig. 2) and 500 m (Fig.3). A total of 622 samples are required to provide an excellent coverage of the river sediments. Extra samples will be collected, if necessary, during the field program to ensure complete coverage (e.g , banks, beaches, floodplain etc.).

British Columbia

Washington

N

Columbia River
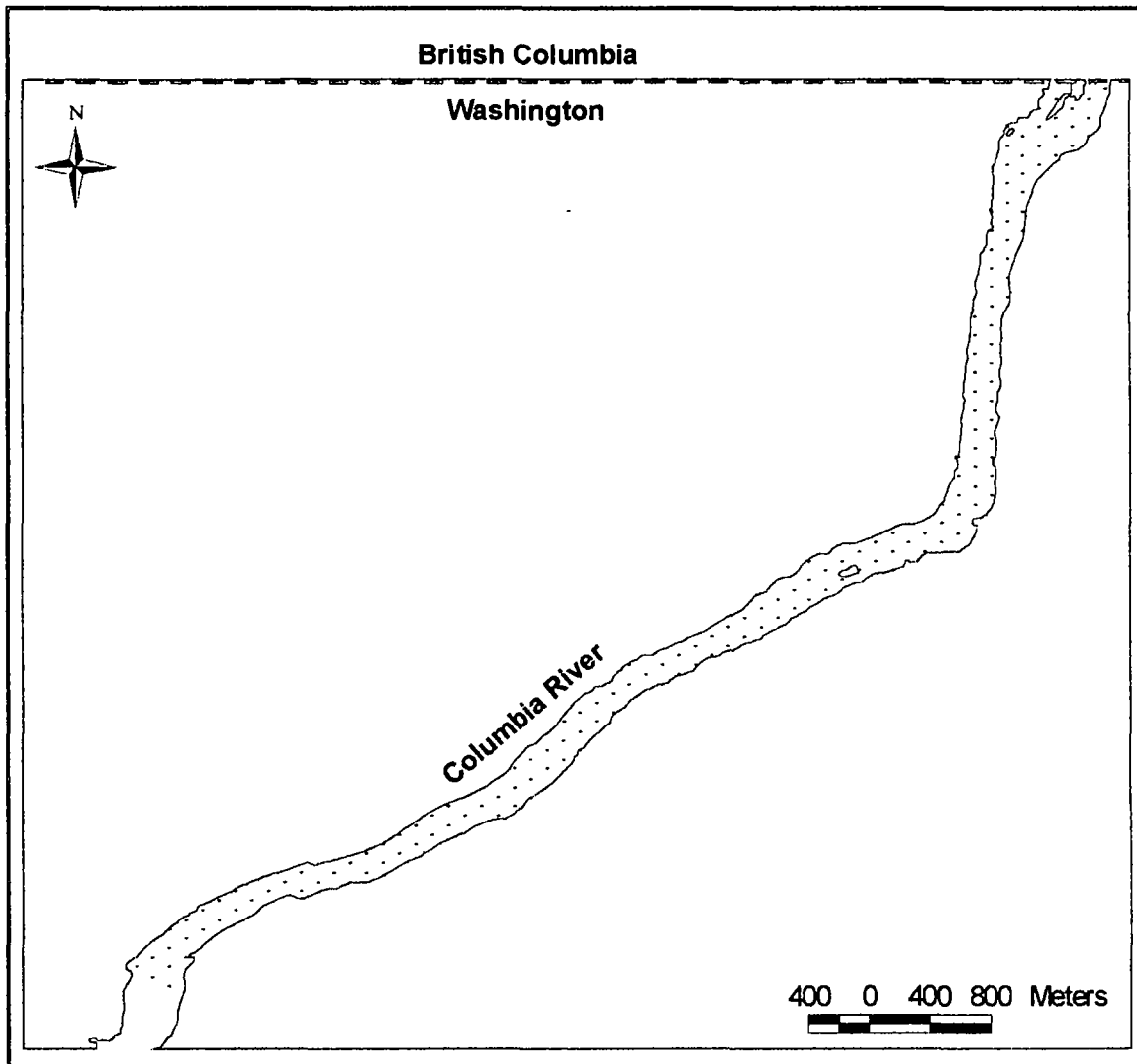
400   0   400   800   Meters
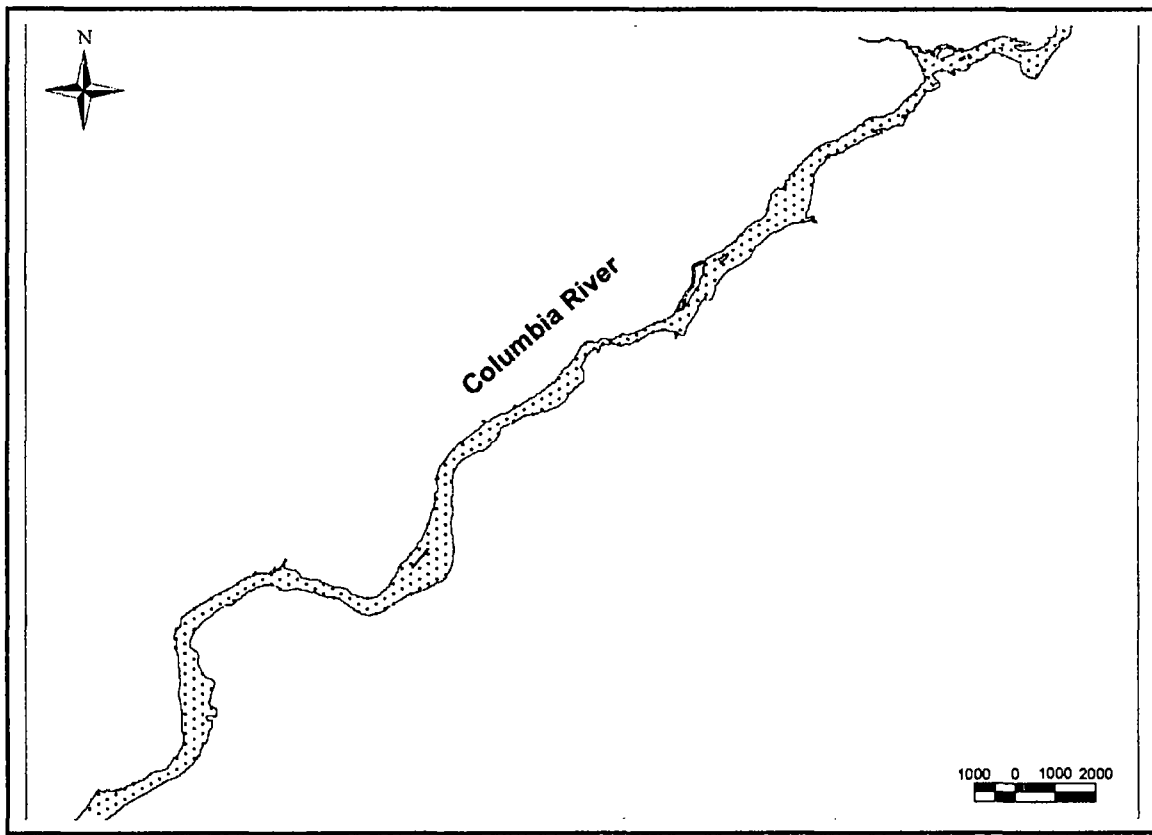
Figure 1: Sample design with a spacing of 125 m

Figure 2: Sample design with a spacing of 250 m
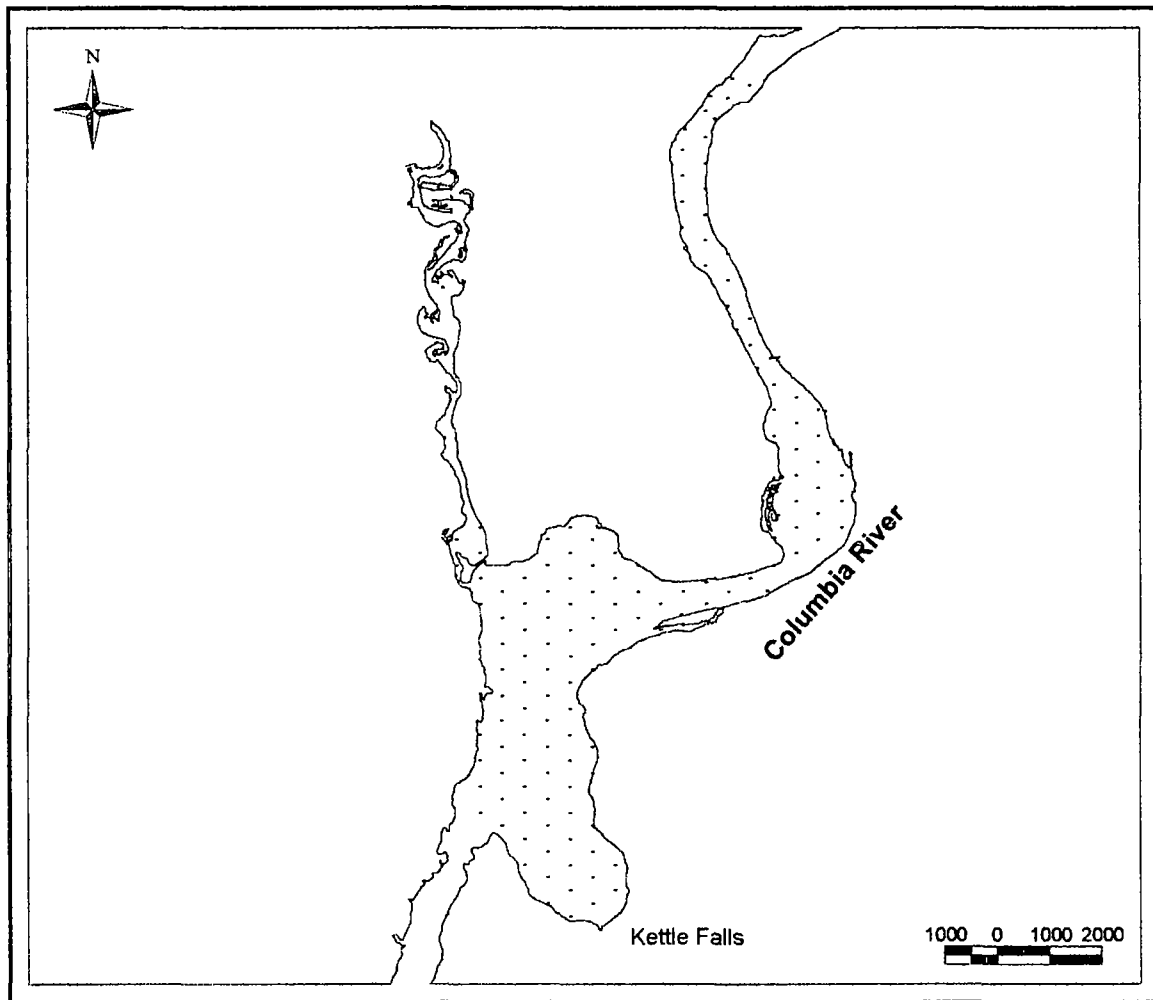
Figure 3: Sample design with a spacing of 500 m

OBJECTIVES

The specific objectives of the Sediment Trend Analysis are to:

(1) Collect about 622 sediment grab samples from the Columbia River between the Canada/US border in the north to Kettle Falls in the south.

(2) Analyze all samples for their complete grain-size distributions and establish, using the technique of sediment trends, the present patterns of transport.

(3) Correlate and discuss the derived patterns of transport with known and/or probable processes as determined by the literature or ongoing studies.

(4) Correlate the results of the STA with the contaminant data[1] to establish the relationships among sediment types, dynamic behaviour, and contaminant level.

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[1] It is assumed that all, or as much as possible, contaminant data will be supplied to GeoSea by the client

(5) Use the above findings to

(i) Determine areas of contaminant build-up or dispersal in all the sedimentological environments encompassed in the study area;

(ii) Predict the long-term fate of contaminants associated with the sediments (i.e., further transport and build-up, burial, dispersal etc.,);

(iii) Suggest, if applicable, techniques to remediate areas of high contamination as well as assess the environmental consequences of such actions;

(iv) Devise a rational strategy for future environmental monitoring to ensure maximum benefit for minimal costs.

(v) Advise, if applicable, on other river management issues related to the movement of sediment and contaminants (e.g., the fate and effects of contaminants from sources unrelated to Teck Cominco).

METHODS

Sample Collection

Sampling will be undertaken from a 12-foot, hard-bottom, inflatable speed boat (Caribe) equipped with a depth sounder, differential Global Positioning System (GPS), and an electric winch for a small stainless steel grab sampler. The GPS (Trimble 212L) is accurate to well under 2 m. The fieldwork is estimated at obtaining 50 samples per day for 12 days. Two extra days are included to cover transit and start-up time, unpredicted downtime, and bad weather.

Sediment Analysis

All samples will be analyzed for their complete grain-size distribution using a Malvern MasterSizer 2000 laser particle size analyzer. This instrument is capable of determining the size spectrum of particles with sizes between $0.02\mu m$ and $2000\mu m$. The distributions, combined with sieve data for sizes $>1500\mu m$, are "merged" using an algorithm developed by GeoSea. It is essential that all distributions are measured at ½ phi class intervals and that closure of the tails is less than 1 per cent

Trend Analysis

Sediment Trend Analysis has been developed solely by GeoSea Consulting. The theory which has been published[2] relates sediments in a given transport direction by

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[2] McLaren, P and Bowles, D , 1985 The effects of sediment transport on grain-size distributions; Journal of Sedimentary Petrology, v 55, 457-470

a sediment transfer function, $X(s)$, so that $d_2(s)=d_1(s)X(s)$ where $d_1(s)$ and $d_2(s)$ are grain-size distributions of any two samples and "s" is grain-size in phi units. Depending on the shape of $X(s)$, the function that describes the relative probability of any particular size being moved (i.e., eroded, transported and deposited), $d_2(s)$ may become finer, better sorted and more negatively skewed, or coarser, better sorted and more positively skewed than $d_1(s)$. Either relationship between $d_1(s)$ and $d_2(s)$ suggests that transport is occurring in the direction defined by the location of the two samples.

The shape of $X(s)$ also determines the nature of the processes resulting in transport and provides the interpretation with respect to erosion, deposition, or dynamic equilibrium. Directions of transport are determined statistically, based on the numbers of specific grain-size trends exceeding random probability over the sampled area.

Patterns of net sediment transport are determined over two-dimensions by "exploring" for sample sequences that produce statistically acceptable trends. A final interpretation is accepted only when all, or nearly all, of the samples are contained in mutually supporting sequences that produce a coherent pattern over the entire study area. Separate trend analyses are undertaken on the different facies that may be present (i.e., mud, sand, sandy mud, etc.).

The relationships between contaminants and dynamic behaviour (based on the shape of the X-distribution) of the sediments are described as follows[3]:

(1) Given a greater surface area and more sites available for adsorption, contaminants have a greater association with fine sediment (silt and clay) than with coarse sediment (sand)

(2) Sediments in Dynamic Equilibrium show no relationship between contaminant concentrations and distance along a transport path.

(3) In environments undergoing Net Accretion there is a general linear increase of contaminant concentrations along the transport path.

(4) Contaminant loadings decrease rapidly with Net Erosion. Contaminant monitoring in such an environment will not provide useful results.

(5) In environments of Total Deposition (I) contaminants are found as localized "highs" that can usually be associated with a specific source.

(6) When the X-distribution is horizontal (Total Deposition II), all particles, whether contaminated or not, have an equal probability of deposition. There is not, therefore, any preferred area for the deposition of contaminants and more or less equal concentrations are to be expected throughout such an environment.

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[3] McLaren, P., 1987 The effects of sediment transport on contaminant dispersal an example from Milford Haven, Wales Marine Pollution Bulletin, 18, 586-594

McLaren, P, Cretney, W J, and Powys, R I L, 1993 Sediment pathways in a British Columbia fjord and their relationship with particle-associated contaminants. Journal of Coastal Research, 9, 1026-1043

WORK PROGRAM

It is proposed to undertake the work in the following Phases

Phase 1: Start-up period. Examination of charts, and relevant published and unpublished literature. Final planning of sample locations. Mobilization of equipment.

Phase 2: Field program

Phase 3: Sample analyses.

Phase 4: Data examination, merging and input to sediment trend software.

Phase 5: Sediment Trend Analysis.

Phase 6: Correlation between STA and contaminant data

Phase 7: Consultation between GeoSea and the client.

Phase 8: Preparation of final report.

PRODUCT

The final product will include a report and all appropriate maps and tables. The report will contain:

(1) A summary of the theory and established methods employed in carrying out STA

(2) An Appendix (both hard copy, and stored on magnetic media) of all grain-size and contaminant data.

(3) The sediment trend statistics for all lines of samples utilized to determine transport directions.

(4) A discussion of the derived transport paths with known processes.

(5) A Geographical Information System (GIS) on CD-ROM containing all the study results, including maps showing patterns of sediment transport, areas of erosion, deposition or dynamic equilibrium, contaminant data etc. If the client has ArcView™ Version 3.0a or later available, a full GIS will be provided, otherwise a slightly limited version based on the public domain ArcExplorer will be provided.

(6) An analysis of how the findings of the study relate to each of the specific objectives as listed above.

PERSONNEL

Patrick McLaren

B Sc.	(b) (6)	University of Calgary, Geology
M.Sc.		University of Calgary, Geology
Ph.D.		University of South Carolina, Geology

Dr. McLaren who founded GeoSea in 1986 will be the project manager and responsible for the overall project. He will take part in the field program and undertake the Sediment Trend Analysis, the presentation of the interpretation, and the preparation of the final report. Dr. McLaren has studied geomorphology, hydrology and sedimentology since 1972 and has published widely on all these subjects.

Steven Hill

B.Sc.	(b) (6)	University of British Columbia, Hons. Physics
M.Sc.		University of Victoria, Marine Biology
Ph.D.		University of British Columbia, Oceanography

Dr. Steven Hill joined GeoSea in 1995 and is primarily involved in company research. He may participate in the field program and will ensure that all data are correctly inputted for the Sediment Trend programming. He will participate in an advisory capacity for all phases of the study.

Dušan Markovic,

B.A. (b) (6), McMaster University, Geography and GIS.

Dušan Markovic joined GeoSea in January 1998 and has the responsibilities of field work and analyzing sediment samples using the Malvern. In addition, he prepares and edits the grain-size data for inclusion in the Sediment Trend program. Mr. Markovic also is a specialist in GIS, and is responsible for preparing the results of the STA in GIS format.

EXPERIENCE AND TECHNICAL COMPETENCE

GeoSea was founded in 1985 and has completed over 80 projects using STA since its inception. The purposes for these studies, although variable, have had a common thread – namely to provide rational marine and river management decisions based on a knowledge of how the natural environment is "working".

The value of STA has long been recognized by the Dutch Government (Rijkwaterstaat) for whom GeoSea has studied virtually the entire coastline of the Netherlands, including the Waddenzee and large areas of the North Sea.

More recently, GeoSea has been carrying out many projects in the USA, most of which have been concerned with contaminant transport issues in the Puget Sound area (Seattle, Tacoma and Eagle Harbors), Monterey Bay, California, the Anacostia River, Washington DC, and the Willamette River, Portland.

References to several managers for GeoSea projects that are related in scope to this one are as follows:

(1) Bud Preston (Hylebos Waterway), Kaiser Aluminum, Tacoma, Washington (509) 242-1079

(2) Catherine Creber (St. Clair River, Ont), Dow Chemical, Sarnia, Ont. (513) 339-5004

(3) Mike Buchman, (Anacostia River, Wash. DC), NOAA/EPA, Seattle, WA. (206) 526-6340

(4) Tray Harbert, (Willamette River), Port of Portland, Portland, Oregon (503) 944-7325.

Please refer to the Company Website (www.geosea.ca) for a complete list of projects.

COST PROPOSAL ($US)

Personnel

Phase	McLaren (days)	Hill (days)	Markovic (days)
1 - Start up	2	-	2
2 - Field Programme (17 days incl. travel)	14	-	14
3 - Sample Analysis	-	-	-
4 - Data Examination and Input	-	1	-
5 - Trend Analysis	6	-	-
6 – Correlation with contaminant data	2	-	4
7 - Client Consultation	3	-	-
8 - Report Preparation	6	2	4
Total days:	33	3	24

	No. of Days	Daily Rate	Cost
McLaren	33	$825.00	$27,225.00
Hill	3	$82500	$2,475.00
Markovic	24	$600.00	$14,400.00
		Total:	$44,100.00

Materials

	No. of samples	Cost per Sample	Cost
1 - Sample Analysis	594	$85.00	$50,490.00
	No. of Days	Cost per Day	
2 – Boat Charter	18	$250.00	$4,500 00
3 - Field Expenses (28person/days@$200/day)			$5,600.00
4 – Airfare (1 round trip)			$500.00
5 – Car rental			$500.00
6 – Phone, freight, charts, etc.			$200.00
4 - Report preparation costs			$800.00
		Total:	$62,290.00

Totals

Personnel.	$44,100.00
Materials:	$62,290.00
Grand Total:	$106,390.00

7.0 TIMING AND PROPOSED PAYMENT SCHEDULE

Date	Phase	Payment
Project Start	Start of Phase 1. Mobilization.	
3 weeks after Project Start	Phase 2: (Field Program) Complete	$33,400.00
1.5 months after Project Start	Phase 3: (Sample Analysis) Complete: Hard copy and computer disk of complete grain-size distributions submitted to client.	$50,490.00
3.0 months after Project Start	Phase 7: Client consultation to present the results of the STA and contaminant correlation	No Cost
4.0 months after Project Start	Phase 8: Completion of Final Report.	$22,500.00
	Total	$106,390.00